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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/848,773	05/03/2001	Qian Chen	06666/076001/USC-2892	6630

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12390 EL CAMINO REAL  
SAN DIEGO, CA 92130-2081

EXAMINER

NGUYEN, KIMBINH T

ART UNIT	PAPER NUMBER
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2671

DATE MAILED: 11/26/2003

8

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/848,773

**Applicant(s)**

CHEN ET AL.

**Examiner**

Kimbinh T. Nguyen

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-24 and 29-39, 43-63 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24, 29-39 and 43-63 is/are rejected.
- 7) ☒ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_. 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. This action is responsive to amendment filed 10/10/03.
2. Claims 1-24, 29-39, 43-63 are pending in the application.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-13, 16, 20-24, 29, 35-37, 39 and 43-63 are rejected under 35 U.S.C. 103(a) as being unpatentable Zhang et al. (6,608,923) in view of Zhang et al. (6,606,406).

**Claims 1, 50**, Zhang et al. (6,608,923) discloses obtaining two images of similar image information (212, 214 of fig. 2; fig. 3, #314) from two uncalibrated sources (col. 6, lines 58-60); superimposing lines (pairs of corresponding epipolar lines) to rectify the two images (col. 7, lines 48-66; fig. 5); using the rectified images to form 3D (col. 2, lines 25-37) by forming a disparity map of 3D. Zhang et al. (6,608,923) does not teach forming of 3D by using a disparity map; however Zhang et al. (6,606,406) teaches disparity map (sampling) (col. 14, lines 29-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the disparity

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map as taught by Zhang for forming 3D image from 2D similar images, because it would obtain a likelihood of pixel disparity (col. 14, lines 30-31).

**Claims 2, 9-13, 16, 24**, Zhang's (6,606,406) teaches disparity map indicating an estimate of 3D surface (col. 13, lines 61-67; fig. 5, #530), 3D information of image (col. 11, lines 25-35; fig. 3, #360; fig. 8); a difference between coordinates of matching pixels (col. 12, lines 12-21); a variable denoting a degree of similarity between pixels, a variable of error in 3D surface (a seed of voxels) by finding uniqueness, and tracing a surface of seed voxels); dividing the surface into parts, the seed voxels are respectively for parts.

**Claims 3, 4**, Zhang (6,606,406) discloses manually establishing matching parts (by a user; col. 9, lines 26-38); identifying parts in the image (col. 9, lines 39-53), using automatically rectified images to form 3D information (col. 16, lines 26-59).

**Claims 5-7**, Zhang (6,608,923) discloses defining images in terms of epipolar geometry (col. 5, lines 29-32; col. 6, lines 44-49), aligning the images in the epipolar geometry; aligning specified reference lines which include lines passing through manually-obtained image parts (col. 12, lines 34-53).

**Claim 8**, Zhang (6,608,923) discloses finding an average of end points of two different reference lines (a pair of epipolar lines), forming a line through an averaged part (col. 6, lines 30-43; figs. 4 and 5).

**Claims 19-23**, Zhang (6,606,406) teaches converting the volume to Euclidean points; projecting a reconstruction of the volume (any geometry), reconstructing Euclidean points; transforming an origin of coordinate system to an origin of the images

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(col. 10, line 57 through col. 11, line 10); input a parameter (focal length), adjust the parameter to approximate a proper Euclidean reconstruction (col. 16, lines 52-59).

**Claims 29, 31, 32, 33**, Zhang (6,608,923) discloses obtaining first and second images of the same object (fig. 2; #210, #212, #214); identifying objects in the first and second images, forming lines which intersect the objects; aligning the lines in an epipolar geometry (figs. 4 and 5); using the first and second images with the aligned lines to form 3D information (figs. 8-11); identifying seed voxel (3D corresponding pixel information  $u, v$  that is unique) for different parts of 3D surface with a high probability of being correct 3D which is greater than a specified threshold (0.99 or equals to one); (col. 6, lines 2-9). Zhang does not teach identifying a seed voxel; however, Zhang teaches 3D object, in the image, points and lines are represented by 3D column vectors, where the points are uniquely identified by  $u, v$  and  $w$  (col. 5, line 59 through col. 6, line 9), and could be a voxel when pixel is identified in the 3D space data or volume data. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a seed voxel, because rectification of each image is produced with minimum distortion (col. 2, lines 36-37).

**Claim 39**, the rationale provided in the rejection of claims 9 and 29 is incorporated herein.

**Claims 43 and 44**, Zhang (6,608,923) teaches an image from two uncalibrated cameras to obtain 3D information (col. 6, lines 18-22, lines 59-60); rectifying the image (col. 2, lines 36-37) to form coplanar images with scan lines are horizontally parallel; identifying points, scan lines which pass through the points forming horizontally parallel

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scan lines (col. 1, lines 38-50). **Claim 45**, Zhang et al. (6,606,406) teaches disparity map (sampling) (col. 14, lines 29-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the disparity map as taught by Zhang for forming 3D image from 2D similar images, because it would obtain a likelihood of pixel disparity (col. 14, lines 30-31).

**Claims 46-63**, the rationale provided in the rejection of claims 1, 3, 5-8, 29, 43, 44 above is incorporated herein.

5. Claims 14, 15, 17, 18, 30, 34-38 are rejected under 35 U.S.C. 103(a) as being unpatentable Zhang et al. (6,608,923) in view of Zhang et al. (6,606,406), and further in view of VanEssen et al. (6,591,004) and Szeliski et al. (5,917,937).

**Claims 14, 15, 17, 18**, VanEssen et al. teaches tracing voxels in a multiresolution at coarsest level and a more detailed level (col. 25, lines 42-45; col. 26, lines 55-67); selecting the seed voxel using a winner take which has a maximum correlation value; identifying seed voxels which represent incorrect matches, removing the seeds after tracing (col. 19, lines 53-67). VanEssen does not teach using a winner take which has a maximum correlation value; however, Szeliski et al. teaches winning cell (col. 9, lines 40-45). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the seed voxel and winning cell as taught by VanEssen and Szeliski into the rectifying images of Zhang's method for forming 3D images, because it would provide a stereo matching method simultaneously recovers disparities from input images to reconstruct 3D surface (Szeliski: abstract). Further,

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**Claim 30, 34-38**, VanEssen et al. teaches forming the surface map by propagating from the seed voxel; determining intersection between two voxels at different parts; determining probability of two voxels finding neighbors for voxels one by one);(col. 25, lines 49-55), and selecting the higher probability as the voxel to use selecting a seed voxel that the best matches the corresponding pixel information and has a probability of being correct which is greater than a specified threshold (col. 26, line 64 through col. 27, line 5); identifying voxels represent incorrect matches and removing incorrect matching voxels (col. 23, lines 27-40).

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kimbinh Nguyen** whose telephone number is **(703) 305-9683**. The examiner can normally be reached **(Monday- Thursday from 7:00 AM to 4:30 PM and alternate Fridays from 7:00 AM to 3:30 PM)**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

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Washington, D.C. 20231

**Or faxed to:**

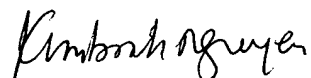
**(703) 872-9314 (for Technology Center 2600 only)**

Hand-delivered responses should be brought to Crystal Part II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

November 24, 2003

A handwritten signature in cursive script, appearing to read "Kimbinh Nguyen".

Kimbinh Nguyen

Patent Examiner AU 2671